IOWA DEPARTMENT OF TRANSPORTATION

To Office Bridges and Structures Date May 26, 2004

Attention All Employees Ref No. 521.1

From Gary Novey

Office Bridges and Structures

Subject Methods Memo No. 92 (Leveling Pads for Masonry Plates and Steel Bearings)

A survey of state bridge bearing details indicates that state departments of transportation no longer are exclusively using lead leveling pads. Some states are listing options for the leveling pads below masonry plates, and some states have changed entirely from lead to elastomeric pads.

The most recent draft of the AASHTO/NSBA steel bridge bearing guide recommends an 1/8 inch thick preformed pad of elastomeric, cotton duck, or random fiber material and also recommends a maximum durometer of 70 for the pads. Lead is not among the options.

The reasons for the change from lead to elastomeric pads seem to be environmental and economic. In the United States there has been a movement away from use of lead in gasoline and paint because of lead's adverse effects on health. Although lead leveling pads are not likely to cause significant human exposure, use of an alternate material would eliminate any minimal exposure to construction workers. It is likely that alternate materials also would reduce cost of the leveling pads, although the reduction is insignificant in comparison with the cost of a bridge.

With this memo the office is changing policy to allow the option that leveling pads be plain neoprene, 1/8 inch thick and one inch larger in each dimension than the bottom surfaces of masonry plates or steel bearings. Leveling pads shall be of 50 durometer neoprene that meets the requirements of Article 4195.02 of the standard specifications. Leveling pads need not be designed for compressive stress because they are assumed to yield* and deform to fill the uneven surfaces of the concrete bearing seats.

One-eighth inch thick lead leveling pads will be permitted until standard sheets and other office documents are revised

*Recent testing has indicated that lead yields in compression at 1000 to 1500 psi. In the AASHTO bridge specifications, allowable compression stress for plain elastomeric pads is a maximum of 800 psi. AASHTO allowable concrete bearing stress is 1050 to 2100 psi for 3500 psi concrete and 1500 to 3000 psi for 5000 psi concrete, depending on the square root of a loaded area ratio. Therefore, it is likely that leveling pads of either lead or neoprene will yield under typical service conditions.

Until the standards can be updated the following note should be included on the bridge plans:

THE CONTRACTOR WILL BE ALLOWED TO SUBSTITUTE 1/8 INCH NEOPRENE SHEETS WITH 50 DUROMETER HARDNESS IN PLACE OF THE 1/8 INCH LEAD SHEET ON THE BEARING DETAILS. THE NEOPRENE SHEETS SHALL BE 1 INCH GREATER IN LENGTH AND WIDTH THAN THE BOTTOM SURFACES OF THE MASONRY PLATES OR STEEL BEARINGS. PAYMENT FOR STRUCTURAL STEEL WILL INCLUDE NO DEDUCTION IN STEEL WEIGHT DUE TO ELIMINATION OF THE LEAD SHEETS AND/OR NO ADDITIONAL COSTS ASSOCIATED WITH THE ADDITION OF THE NEOPRENE SHEETS.

References:

AASHTO/NSBA Steel Bridge Task Group 9, Bearings. *Standard G9.1, Guidelines for Steel Bridge Bearing Design and Detailing*. Draft, November 19, 2003.

Riddington, John R. and Manjinder K. Sahota. "Mechanical Properties of Lead in Compression." *Journal of Materials in Civil Engineering*, Vol. 15, No. 4, August 1, 2003, pp 323-328.

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